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09/618,202	07/18/2000	Kenji Yamagami	16869C008600US	9713

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EXAMINER	
HOFFMAN, BRANDON S	

ART UNIT	PAPER NUMBER
2136	3

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/618,202	YAMAGAMI ET AL.	
	Examiner	Art Unit	
	Brandon Hoffman	2136	

-- The MAILING DATE of this communication appears on the cover sheet with the correspond nc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-31* is/are rejected.

7)☒ Claim(s) *4-8 and 25* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 July 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 2.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: figure 1 does not include reference numbers 133 and 135, LAN and proprietary connection, respectively.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: Figure 4, reference numbers 420, 450, 460, 470, and 480. Also, figure 5, reference numbers 510, 520, and 560. Also, all of figure 6 and all of figure 7 are not shown. In figure 8, reference numbers 820, 830, 840, 850, 860, and 880. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities:

- On page 6, line 11, "Steps 310-330" should be – Steps 300-320 –. Appropriate correction is required.

Claims 4-8 and 25 are objected to because of the following informalities:

Regarding claim 25, line 11, "and" is missing from the claim.

Regarding claims 4-8: The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claim 4 shall be renumbered 7. Misnumbered claim 5 shall be renumbered 4. Misnumbered claim 6 shall be renumbered 8. Misnumbered claim 7 shall be renumbered 5. Misnumbered claim 8 shall be renumbered 6.Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a Yanai et al. having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 12, 16, 17, and 25-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohran (U.S. Patent No. 6,397,307) in view of Yanai et al. (U.S. Patent No. 5,544,347).

Regarding claim 1, Ohran teaches a method of controlling security of data in a storage system having a local disk system and a remote disk system comprising:

- In the local disk system:
    - When a write of data is to be made to the local disk system retrieving a previously stored encryption key (col. 11, lines 24-26 suggests to use stored encryption keys for encryption, even though the teachings of Ohran dynamically creates an encryption key);
    - Encrypting the data (col. 11, lines 43-45);
    - Transferring the data to the remote disk system (col. 11, lines 45-47);
- Then in the remote disk system:
    - Determining an address for storage of the data (col. 9, lines 29-35 and col. 10, lines 21-27);
    - Writing the data in the remote disk system (col. 9, lines 39-43 and col. 10, lines 21-27);
    - Determining whether the data is to be stored in an encrypted form (col. 11, lines 40-43 suggests that some of the data can be encrypted, but does not necessarily mean the same data has to be decrypted); and
    - If the data is to be stored in a decrypted form, decrypting the data (col. 11, lines 47-49).

Ohran does not teach notifying the local disk system that the step of writing the data is complete.

Yanai et al. teaches notifying the local disk system that the step of writing the data is complete (col. 6, lines 41-46).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to combine notifying the local disk system that the step of writing the data is complete, as taught by Yanai et al., to the method of Ohran. It would have been obvious to one of ordinary skill in the art to combine notifying the local disk system that the step of writing the data is complete, as taught by Yanai et al., to the method of Ohran because the notification allows the local disk system to know that the data is synchronized between the local and remote disk system.

Regarding claim 12, Ohran teaches a method for changing an encryption key while operating a storage system having a local disk system and a remote disk system comprising:

- Storing an encryption key in a memory in the local disk system (fig. 6, ref. num 106a);
- Transmitting the encryption key to the remote disk system and storing it in a memory there (fig. 6, ref. num 16 and 106b);
- Splitting the local disk system from the remote disk system to allow them to operate independently (fig. 2, the time between consolidations the local system is operated independently of the remote system); and

- Using a new encryption key to begin storing data in the local disk system (col. 11, lines 52-55)

Ohran does not teach re-synchronizing the local disk system and the remote disk system.

Yanai et al. teaches re-synchronizing the local disk system and the remote disk system (col. 6, lines 38-51).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to combine re-synchronizing the local system and the remote system, as taught by Yanai et al., to the system of Ohran. It would have been obvious to one of ordinary skill in the art to combine re-synchronizing the local system and the remote system, as taught by Yanai et al., to the system of Ohran because synchronizing the data between the local and remote systems will make sure the remote system has the same data as the local system. This is important in systems where data is mirrored or backed-up.

Regarding claims 16 and 26, Ohran teaches a method/system of controlling encryption in a storage system having a local disk system and a remote disk system comprising:

- Storing an encryption key in a memory in the local disk system (fig. 6, ref. num 106a);
- Transmitting the encryption key to the remote disk system and storing it in a memory there (fig. 6, ref. num 16 and 106b);
- Splitting the local disk system from the remote disk system to allow them to operate independently (fig. 2, the time between consolidations the local system is operated independently of the remote system); and
- Switching encryption to an opposite state from a previous state (col. 11, lines 40-43, the data can be encrypted at any time and can not be encrypted anytime, it all depends on the users' data).

Ohran does not teach re-synchronizing the local disk system and the remote disk system.

Yanai et al. teaches re-synchronizing the local disk system and the remote disk system (col. 6, lines 38-51).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to combine re-synchronizing the local system and the remote system, as taught by Yanai et al., to the system of Ohran. It would have been obvious to one of ordinary skill in the art to combine re-synchronizing the local system and the remote system, as taught by Yanai et al., to the system of Ohran because synchronizing

the data between the local and remote systems will make sure the remote system has the same data as the local system. This is important in systems where data is mirrored or backed-up.

Regarding claim 17, Ohran teaches a storage system comprising:

- A local system (fig. 1, ref. num 12);
- A first computer program operating on the local system to determine whether encryption is to be employed in storage of data on the local system, and if so, retrieving an encryption key from storage and using the key to encrypt the data to be stored (col. 11, lines 24-26 and 40-45 suggests that some of the data can be encrypted, but does not necessarily mean that all the data has to be encrypted);
- A communications link coupling the local system to the remote system (fig. 1, ref. num 16); and
- A second computer program operating on the remote system to store the data in either encrypted form or unencrypted form based and storing the data in that form in the remote system (col. 11, lines 47-49 and 40-43 suggests that some of the data can be encrypted, but does not necessarily mean the same data has to be decrypted).

Ohran does not teach the local system including a plurality of volumes of media for storing data and notifying the local disk system that the data has been stored.

Yanai et al. teaches the local system including a plurality of volumes of media for storing data (fig. 1, ref. num 20) and notifying the local disk system that the data has been stored (col. 6, lines 41-46).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to combine the local system including a plurality of volumes of media for storing data and notifying the local disk system that the data has been stored, as taught by Yanai et al., to the system of Ohran. It would have been obvious to one of ordinary skill in the art to combine the local system including a plurality of volumes of media for storing data and notifying the local disk system that the data has been stored, as taught by Yanai et al., to the system of Ohran because the plurality of volumes for storing data allows the local disk system to contain a volume that is local only to it and volumes that are accessible by the remote system (col. 5, lines 11-34) and the notification allows the local disk system to know that the data is synchronized between the local and remote disk system.

Regarding claim 25, Ohran teaches a storage system having a local system and a remote system, and having changeable encryption keys, comprising:

- A local memory which stores an encryption key in the local system (fig. 6, ref. num 106a);
- A communications link connecting the local system to the remote system for transmitting the encryption key to the remote disk system (fig. 6, ref. num 16);

- A remote memory which stores the encryption key in the remote system (fig. 6, ref. num 106b);
- A first computer program in the local system which determines a boundary for use of the encryption key and splitting of the local system from the remote system (col. 11, lines 52-55 the keys are changed at every time of consolidation and fig. 2, the time between consolidations the local system is operated independently of the remote system); and
- In both the local and the remote disk system, a second computer program for determining a relationship of present operations to the boundary, and splitting the local system from the remote system at the boundary (fig. 2, ref. num 30, 36, and 42, the time between consolidations the local system is operated independently of the remote system).

Ohran does not teach a third computer program for re-synchronizing the local system and the remote system.

Yanai et al. teaches a third computer program for re-synchronizing the local system and the remote system (col. 6, lines 38-51).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to combine a third computer program for re-synchronizing the local system and the remote system, as taught by Yanai et al., to the system of Ohran. It

would have been obvious to one of ordinary skill in the art to combine a third computer program for re-synchronizing the local system and the remote system, as taught by Yanai et al., to the system of Ohran because a third program will allow synchronize the data between the local and remote systems so the remote system has the same data as the local system. This is important in systems where data is mirrored or backed-up.

Regarding claim 27, Ohran teaches a method of controlling security of data in a storage system having a local disk system and a remote disk system comprising:

- In the local disk system:
    - Assigning a key to the local disk system (col. 11, lines 43-45);
    - Encrypting the data stored in the local disk system (col. 11, lines 43-45);
    - Transferring the encrypted data to the remote disk system (col. 11, lines 45-47);
- Then in the remote disk system:
    - Decrypting the data using the assigned key (col. 11, lines 47-49); and
    - Writing the decrypted data into the remote disk system (col. 9, lines 39-43 and col. 10, lines 21-27).

Ohran does not teach a first portion of the local disk system or a second portion of the remote disk system.

Yanai et al. teaches a first portion of the local disk system (fig. 1, ref. num 22a) and a second portion of the remote disk system (fig. 1, ref. num 50a).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to combine a first portion of the local disk system and a second portion of a remote disk system, as taught by Yanai et al., to the method of Ohran. It would have been obvious to one of ordinary skill in the art to combine a first portion of a local disk system and a second portion of a remote disk system, as taught by Yanai et al., to the method of Ohran because the first and second portions allow the local and remote disk system to contain separate portions that are local only and accessible by the other disk system (col. 5, lines 11-34).

Regarding claim 28, the combination of Ohran as modified by Yanai et al. teaches wherein the first portion comprises at least a volume of the local storage system and the second portion comprises at least a volume of the remote disk system (see fig. 1, ref. num 20 and 48 of Yanai et al.).

Regarding claim 29, the combination of Ohran as modified by Yanai et al. teaches wherein the first portion comprises a group of volumes of the local storage system (fig. 1, ref. num 22a-c of Yanai et al.), and the second portion comprises a group of volumes of the remote storage system (see fig. 1, ref. num 50a-c of Yanai et al.).

Regarding claim 30, Ohran teaches a storage system comprising:

- A local system (fig. 1, ref. num 12);
- A remote system (fig. 1, ref. num 14);
- A first computer program operating on the local system to retrieve selected data from storage on the local system, and encrypt the selected data using an encryption key (col. 11, lines 43-45);
- A communications link coupling the local system to the remote system for transmitting the selected data to the remote system (fig. 1, ref. num 16); and
- A second computer program operating on the remote system to decrypt the selected data received from the communications link and store that selected data in unencrypted form in the remote system (col. 11, lines 47-49).

Ohran does not teach the local and remote system including a plurality of volumes of media for storing data.

Yanai et al. teaches the local and remote system including a plurality of volumes of media for storing data (fig. 1, ref. num 20 and 48).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to combine the local and remote system including a plurality of volumes of media for storing data, as taught by Yanai et al., to the system of Ohran. It would have been obvious to one of ordinary skill in the art to combine the local and remote system including a plurality of volumes of media for storing data, as taught by

Yanai et al., to the system of Ohran because the plurality of volumes for storing data allow each disk system to contain a volume that is local only to their system and volumes that are accessible by the other (local or remote) system (col. 5, lines 11-34).

Claims 2-8, 18-22, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohran (U.S. Patent No. 6,397,307) in view of Yanai et al. (U.S. Patent No. 5,544,347), and further in view of Jacobson (U.S. Patent No. 5,548,649).

Regarding claims 2, 18, and 31, the combination of Ohran as modified by Yanai et al. teaches all the limitations of claims 1, 17, and 30, respectively, above. However, the combination of Ohran as modified by Yanai et al. does not teach further comprising a step of maintaining an encryption control table on the local disk system, the encryption control table including a list of encryption keys for selected volumes of the local and the remote disk system.

Jacobson teaches further comprising a step of maintaining an encryption control table on the local disk system (fig. 2, ref. num 232), the encryption control table including a list of encryption keys for selected volumes of the local and the remote disk system (fig. 10).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to combine maintaining an encryption control table on the local

disk system wherein the table includes a list of encryption keys for selected volumes of the local and remote disk system, as taught by Jacobson, to the system of Ohran as modified by Yanai et al. It would have been obvious to one of ordinary skill in the art to combine maintaining an encryption control table on the local disk system wherein the table includes a list of encryption keys, as taught by Jacobson, to the system of Ohran as modified by Yanai et al. because the table provides a list of keys to use for encryption and decryption for the local remote system.

This new system uses a table of keys to determine how and when to encrypt and decrypt the data in the local and remote system.

Regarding claims 3 and 19, the combination of Ohran and Yanai et al. as modified by Jacobson teaches wherein the list of encryption keys further includes information relating to the use and non-use of encryption on the local disk system (see col. 11, lines 40-43 of Ohran suggests that encryption/decryption can occur, but does not have to occur).

Regarding claims 4 and 20, the combination of Ohran and Yanai et al. as modified by Jacobson teaches wherein the list of encryption keys further includes information relating to the use and non-use of encryption on the remote disk system (see col. 11, lines 40-43 of Ohran).

Regarding claims 5 and 21, the combination of Ohran and Yanai et al. as modified by Jacobson teaches wherein the encryption key is applicable to less than all of the storage on the local disk system (see col. 11, lines 40-43 of Ohran shows that some, less than all, of the data is encrypted).

Regarding claims 6 and 22, the combination of Ohran and Yanai et al. as modified by Jacobson teaches wherein the encryption key is applicable to less than all of the storage on the remote disk system (see col. 11, lines 43 of Ohran shows that some, less than all, of the data is decrypted).

Regarding claim 7, the combination of Ohran and Yanai et al. as modified by Jacobson teaches wherein the encryption key is applicable to at least one disk on the local disk system (see col. 11, lines 40-43 of Ohran and fig. 1, ref. num 20 of Yanai et al. shows that the different volumes would not have to be encrypted, such as the local volume, because transmission does not occur from the local volume).

Regarding claim 8, the combination of Ohran and Yanai et al. as modified by Jacobson teaches wherein the encryption key is applicable to at least one disk on the remote disk system (see col. 11, lines 40-43 of Ohran and fig. 1, ref. num 48 of Yanai et al. shows that the different volumes would not have to be decrypted, such as the local volume, because transmission does not occur to the local volume).

Claims 9-11, 13-15, 23, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohran (U.S. Patent Number 6,397,307).

Regarding claims 9 and 23, Ohran teaches a method for changing an encryption key while operating a storage system having a local disk system and a remote disk system comprising:

- Storing an encryption key in a memory in the local disk system (fig. 6, ref. num 106a);
- Transmitting the encryption key to the remote disk system and storing it in a memory there (fig. 6, ref. num 16 and 106b);
- In the local disk system determining a boundary for use of the encryption key (col. 11, lines 52-55 the keys are changed at every time of consolidation);
- In both the local and the remote disk system, determining a relationship of present operations to the boundary (fig. 2, ref. num 30, 36, and 42);
- In both the local and the remote disk system waiting for the boundary, and then changing the encryption key for data stored thereafter (fig. 2, ref. num 32 and 38 and col. 11, lines 52-55).

Ohran does not specifically teach the encryption key is stored in the local disk and transmitted to the remote disk and stored. Ohran teaches the local disk and remote disk exchange values and calculate a key (the keys being equal), which is stored in the local disk system and remote disk system.

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to alter the key exchange process of Ohran to include transmitting the stored key from the local system to the remote system, instead of transmitting values to calculate the key. It would have been obvious to one of ordinary skill in the art to alter the key exchange of Ohran because, as suggested on col. 11, lines 24-26, the keys could already be calculated and stored in the local system. This would save computation time of calculating keys by swapping values between the two systems.

Regarding claim 13, Ohran teaches a method of controlling encryption in a storage system having a local disk system and a remote disk system comprising:

- Determining a boundary in the local disk system where encryption is to be switched to an opposite state (col. 11, lines 52-55 the keys are changed at every time of consolidation);
- Determining a corresponding boundary in the remote disk system (the remote system boundary is the same place that the local system boundary is);
- In both the local and the remote disk system, determining a relationship of present operations to the boundary (fig. 2, ref. num 30, 36, and 42);
- In both the local and the remote disk system waiting for the boundary, and then changing the switching the encryption to the opposite state (fig. 2, ref. num 32 and 38).

Ohran does not teach maintaining a control table in each of the local and remote disk systems, but rather keys (which control encryption) in each system. Also, tables containing data are well known in the art and would be an obvious addition to this system.

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to combine maintaining a control table in each of the local and remote disk systems with the method of Ohran. It would have been obvious to one of ordinary skill in the art to combine maintaining a control table in each of the local and remote disk systems with the method of Ohran because maintaining a control table in the local and remote disk system supplies data values to the disk systems telling them how to respond to data.

Regarding claim 10, Ohran as modified teaches wherein operations before the boundary are performed using a first encryption key and operations after the boundary are performed using a second encryption key (col. 11, lines 52-55).

Regarding claims 11, 15, and 24, Ohran as modified teaches wherein the boundary is defined by counting input/output operations and using the count to define the boundary (col. 13, lines 35-50 uses a decided time T to decide the boundary, and only the last IO operation before a decided time T is transmitted to the remote system).

Regarding claim 14, Ohran as modified teaches wherein operations before the boundary are either encrypted or not encrypted, and operations performed after the boundary are either not encrypted or encrypted oppositely to those operations performed before the boundary (col. 11, lines 40-43, the data can be encrypted at any time and can not be encrypted anytime, it all depends on the users' data).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brandon Hoffman whose telephone number is 703-305-4662. The examiner can normally be reached on M-F 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ayaz Sheikh can be reached on 703-305-9648. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

Brandon Hoffman

BH
2/10/04

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